What is claimed is:

1. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream *S*, carried on a transmission media operating at a first data rate *R*, through a switching system that is comprised of a plurality of *K*, parallel switching pathways operating at a second data rate substantially equal to *R/K*, said method comprising the steps of:

assigning a first data flow f_1 in said stream S to a first switching path comprised of a first data buffer having an output coupled to a corresponding first switching fabric;

after said step of assigning a first data flow f_1, routing to said first switching path, data packets of at least said first data flow f_1;

upon the determination of a first condition, assigning at least some of the data packets of said first data flow f_1 to a second switching path;

routing said at least some data packets of said first data flow f_1 to said second switching pathway. to a second buffer coupled to a second switching fabric.

2. A method of routing data packets of a plurality of data flows f_1-f_n in a stream *S*, carried on a transmission media operating at a first data rate *R*, through a switching system comprised of a plurality of *K*, parallel switching pathways, each switching pathway comprised of an input data buffer that receives data packets from said transmission media via a demultiplexing operation, the data rate of said data packets from said demultiplexing operation being effectively divided to a rate substantially equal to *R/K*, each input buffer coupling data into at least one associated switching fabric at said *R/K* rate, said method comprising the steps of:

assigning a first data flow f_1 to a first switching pathway;

assigning a second data flow f_2 to said first switching pathway

routing to said first switching pathway, data packets, of at least said first data flow f_1 and said second data flow f_2

upon the determination of a first condition, assigning at least some of the subsequent data packets of said second data flow f_2 said stream *S* to a second switching fabric;

routing said at least some data packets of said second data flow f_2 to said second switching fabric.

3. The method of claim 1 wherein said first condition includes at least one of the following conditions:

a. when the aggregate data rate of all the flows f_1-f_n into the first data buffer, exceeds the rate of all flows f_1-f_n leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

b. when the data rate of the data of the flow fi into the first data buffer exceeds the rate of data leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

c. when the data rate of the data flow fi exceeds a predetermined rate;

d. when the aggregate data rate of the flows f_1-f_n into the first data buffer exceeds the data rate of the flows f_1-f_n leaving the first data buffer;

e. when the rate of data of at least one flow fi routed into the first data buffer exceeds the rate of data leaving the first data buffer;

f. when a data format error is detected;

g. when the data stored in said data buffer exceeds a predetermined threshold;

h. when a buffer failure is detected;

i. when a switch fabric failure is detected;

j. when a demultiplexing failure is detected.

4. The method of claim 1 wherein said step of assigning a first data flow to a first switching path includes the step of assigning said first data flow f_1 to a switching path having the smallest amount of data in its corresponding data buffer.

5. The method of claim 1 wherein said step of assigning a first data flow f_1 to a first switching path includes the step of assigning said first data flow f_1 to a switching path having the lowest average rate at which data packets are flowing into the switching path from said stream *S*.

6. The method of claim 1 wherein said step of assigning a first data flow f_1 to a first switching path includes the step of assigning said flow f_1 to a switching path having the lowest average rate at which data packets are flowing into the buffer for said switching path from said stream *S*.

7. The method of claim 1 wherein said step of assigning a first data flow to a first switching fabric includes the steps of periodically re-assigning at least one data flow of said flows f_1-f_n to at least one other switching pathway.

8. The method of claim 1 wherein said step of assigning a first data flow to a first switching fabric includes the step of assigning said flow f_1 to a switching path having the smallest number of different data flows of all said flows f_1-f_n.

9. The method of claim 1 wherein said step of upon the determination of a first condition, assigning at least some of the subsequent data packets of said stream *S* to a second switching pathway, said step of assigning at least some of the subsequent data packets includes at least one of the steps claimed in claims 5, 6, 7 and 8.

10. The method of claim 1 further including the step of: delaying the output of at least some of the data from said second buffer into a second switch fabric until the occurrence of a second condition.

11. The method of claim 10 wherein said second condition includes at least one of:

a. the transfer into said first switch fabric, data of said first flow f_1 that were stored in said first buffer prior to the first condition;

b. the transfer into said first switch matrix, data of all flows f_1-f_n that were stored in said first buffer prior to the first condition;

c. the transfer out of said first fabric, data of said first flow f_1 that were stored in said first buffer prior to the first condition;

d. the transfer out of said first fabric, data of all flows f_1-f_n that were stored in said first buffer prior to the first condition.

12. The method of claim 1 further including the step of: calculating a first flow identifier for each data flow that is carried on said transmission media, said flow identifier being calculated using information embedded within a data packet of each data flow.

13. The method of claim 12 wherein said step of calculating a first flow identifier includes the step of calculating a hash key from IP address information.

14. The method of claim 12 wherein said step of calculating a first flow identifier includes the step of calculating a 16-bit hash key from IP address information comprising said IP data packets.

15. The method of claim 1 wherein said second switching pathway is a fault recovery switching pathway.

16. A method of switching internet protocol (IP) data flows, each of which is comprised of IP data packets, through a switching system having an IP packet input coupled to the inputs of a plurality of parallel switch fabrics which route data to a plurality of destinations, said method comprising the steps of:

receiving at said input port of a switching system, a plurality of IP data flows, each of which is comprised of a plurality of IP data packets;

for at least a first data flow, calculating a data flow index from at least a part of the data packet of said data flow;

routing data packets identified by said data flow index, into a first data buffer, said first data buffer having an output coupling data into a first switch matrix;

upon the determination of a predetermined condition, routing data packets identified by said data flow index into a second data buffer, said second data buffer having an output coupling data into a second switch matrix.

17. The method of claim 16 further including the step of delaying transmission of at least some of the data packets from said second data buffer into said second switch matrix a predetermined length of time that is substantially equal to the time required to transfer into said first switch matrix, at least some of the data from said first data buffer.

18. A data switch comprising:

an input port receiving a stream *S* of internet protocol (IP) data flows f_1-f_n at a rate *R*, each flow being comprised of IP data packets;

a data demultiplexor, having an input coupled to the input port so as to receive said stream *S*, and further having *K* outputs and a control input, said demultiplexor routing data packets of said data flows f_1- f_n to different ones of said *K* data outputs according to a predetermined methodology in response to control input signals on said control input;

K data buffers, each buffer having an input coupled to a respective one of said *K* outputs of said demultiplexor and each having an output;

K switch matrices, each matrix having *K* inputs and at least one output, each of said *K* inputs of each matrix coupled to a respective one of said *K* outputs of said buffers;

a controller, operatively coupled to said data demultiplexor so as to route data packets of said stream *S* to various ones of said *K* data buffers until the occurrence of a predetermined event.

19. The data switch of claim 18 wherein said demultiplexor is a demultiplexor which re-routes at least some of the data packets of said stream *S* from a first data buffer to a second data buffer on the occurrence of a predetermined event.

20. The data switch of claim 18 wherein said demultiplexor re-routes at least some of the data packets of said stream *S*, from a first data buffer to a second data buffer on the occurrence of at least one of the following events:

a. when the aggregate data rate of data of all the flows f_1 - f_n into the first data buffer, exceeds the rate of the data of all flows f_1 - f_n leaving the buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

b. when the data rate of the data of the flow f_i into the first data buffer exceeds the rate of data leaving the buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

c. when the data rate of the data flow *fi* exceeds a predetermined rate;

d. when the aggregate data rate of the data of the flows f_1 - f_n into the first data buffer exceeds the rate of data of flows f_1 - f_n leaving the buffer;

e. when the rate of data of at least one flow *fi* routed into the first data buffer exceeds the rate of data leaving the first buffer;

f. when a data format error is detected;

g. when the data stored in said data buffer exceeds a predetermined threshold;

h. when a buffer failure is detected;

i. when a switch fabric failure is detected;

j. when a demultiplexing failure is detected.

21. The data switch of claim 18 wherein said data queues are comprised of random access memory.

22. The data switch of claim 18 wherein said data queues are comprised of first-in, first-out buffers.

23. The data switch of claim 18 wherein said data queues have an output data rate substantially equal to R/K.

24. The data switch of claim 18 wherein said data queues have an output data rate substantially limited to R/N.

25. A data switch comprising:

an input port receiving a stream S of data flows f_1-f_n

a data flow demultiplexor, having an input coupled to the input port so as to receive said stream S, and further having K outputs and a control input, said data flow demultiplexor routing data packets of said data flows f_1-f_n to different ones of said K data outputs;

K data buffers, each buffer having an input coupled to a respective one of said K outputs of said data flow demultiplexor and each having an output;

K switch matrices, each matrix having K inputs and at least one output, each of said K inputs of each matrix coupled to a respective one of said K outputs of said buffers;

a controller, operatively coupled to said data demultiplexor

wherein data packets of a first flow f_1 of said stream S are routed by said data flow demultiplexor to a first switch matrix, and upon the detection of a predetermined event by said controller, at least a portion of said first flow f_1 is re-routed to a second switch matrix.

26. A data switch comprising:

an input port receiving a stream S of data flows f_1-f_n

a data flow demultiplexor, having an input coupled to the input port so as to receive said stream S, and further having K outputs and a control input, said data flow demultiplexor routing data packets of said data flows f_1-f_n to different ones of said K data outputs, and in response to the occurrence of at least one predetermined event in said data switch, re-routing data packets of at least one of said data flows f_1-f_n from a first data output to a second data output;

K data buffers, each buffer having an input coupled to a respective one of said K outputs of said data flow demultiplexor and each having an output;

K switch matrices, each matrix having K inputs and at least one output, each of said K inputs of each matrix coupled to a respective one of said K outputs of said buffers;

a controller, operatively coupled to said data demultiplexor.

27. The data switch of claim 26 wherein data flow demultiplexor is a data flow demultiplexor that re-routes data packets of said data flows f_1-f_n to different ones of said K data outputs upon the occurrence of at least one of the following events:

a. when the aggregate data rate of data of all the flows f_1 - f_n into a first data buffer, exceeds the rate of the data of all flows f_1 - f_n leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

b. when the data rate of the data of the flow f_i into the first data buffer exceeds the rate of data leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

c. when the data rate of a data flow fi exceeds a predetermined rate;

d. when the aggregate data rate of the data of the flows f_1 - f_n into the first data buffer exceeds the rate of data of flows f_1 - f_n leaving the first data buffer;

e. when the rate of data of at least one flow fi routed into the first data buffer exceeds the rate of data leaving the first data buffer;

f. when a data format error is detected;

g. when the data stored in said data first data buffer exceeds a predetermined threshold;

h. when a data buffer failure is detected;

i. when a switch fabric failure is detected;

j. when a demultiplexing failure is detected.

28. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream S, carried on a transmission media operating at a first data rate R, through a switching system that is comprised of a plurality of K, switching pathways said method comprising the steps of:

routing at least a first portion of a first data flow f_1 in said stream S to a first switching pathway;

upon the determination of a predetermined condition of said first switching pathway, routing at least second portion of said first data flow f_1 to a second switching pathway.

29. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream S, carried on a transmission media operating at a first data rate R, through a switching system that is comprised of a plurality of switching pathways said method comprising the steps of:

routing at least a first portion of a first data flow f_1 in said stream S to a first switching pathway;

upon the determination of a predetermined condition in a second switching pathway, routing at least second portion of said first data flow f_1 to said second switching pathway.

30. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream S, carried on a transmission media operating at a first data rate R, through a switching system that is comprised of a plurality of K, switching pathways each of which operating at a data rate substantially equal to R/K, said method comprising the steps of:

routing at least a first portion of a first data flow f_1 in said stream S to a first switching pathway;

upon the determination of a predetermined condition in a second switching pathway, routing at least second portion of said first data flow f_1 to a third switching pathway.

31. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream S, carried on a transmission media through a switching system that is comprised of a plurality of K, switching pathways to which data flows are routed by de-multiplexing said flows from said stream to switching pathways, said method comprising the steps of:

routing at least a first portion of a first data flow f_1 in said stream S to a first switching pathway;

upon the determination of a predetermined condition in said switching system, which conditions include at least one of:

a. when the aggregate data rate of all the flows f_1-f_n into the first data buffer, exceeds the rate of all flows f_1-f_n leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

b. when the data rate of the data of the flow f_1 into the first data buffer exceeds the rate of data leaving the first data buffer, and, the amount of data stored in the first data buffer exceeds a predetermined threshold;

c. when the data rate of the data flow f_1 exceeds a predetermined rate;

d. when the aggregate data rate of the flows f_1-f_n into the first data buffer exceeds the data rate of the flows f_1-f_n leaving the first data buffer;

e. when the rate of data of at least one flow f_1 routed into the first data buffer exceeds the rate of data leaving the first data buffer;

f. when a data format error is detected;

g. when the data stored in said data buffer exceeds a predetermined threshold;

h. when a buffer failure is detected;

i. when a switch fabric failure is detected;

j. when a demultiplexing failure is detected;

then, routing at least second portion of said first data flow f_1 to a second switching pathway.

32. A method of routing data packets of a plurality of data flows f_1-f_n, in a stream S, carried on a transmission media operating at a first data rate through a switching system that is comprised of a plurality of parallel switching pathways said method comprising the steps of:

routing a plurality of flows f_1-f_n, in said stream S to a first switching pathway comprised of a first data buffer having an output coupled to a corresponding first switching fabric;

upon the determination of the existence of a first condition, routing at least some of the data packets of a first data flow fi to a second switching pathway;